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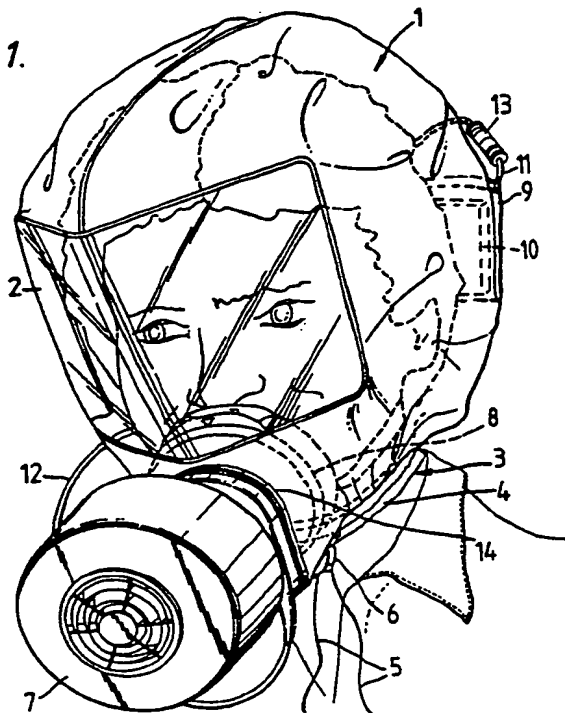
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(54) Respiratory protective apparatus

(57) Respiratory protective apparatus comprises a head-enveloping flexible hood 1, having a neck seal 3, which comprises an elasticated band 6 and drawstring 5 or a septum (24; Fig 4) of highly elastic material, at a lower open end of the hood to engage the neck of an adult wearer or round an infant's waist. A filter 7, which may be an NBC filter, and a fan 8 are mounted to a wall of the hood with the filter located outside the hood (1, 21) and the fan inside the hood and in direct communication with the filter through an aperture 14 in the wall of the flexible hood. A source of power 10 for the fan is supported on the hood either in a pocket 9 formed in the outer wall surface of the hood, or in a housing 30 (Fig. 4) located on the mounting for the filter in a position between the filter and the aperture in the hood. Ear surrounds may be provided to baffle the noise of the fan.

FIG.1.



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RESPIRATORY PROTECTIVE APPARATUS

This invention relates to respiratory protective apparatus and more particularly to respiratory protective apparatus for delivering filtered air to a person wearing the apparatus in a noxious atmosphere.

According to the present invention there is provided respiratory protective apparatus comprising a flexible hood capable of enveloping the head of an adult wearer, a neck seal at an open lower edge of the hood for engaging the neck of an adult wearer, an air moving means and a filter, both mounted to a wall of the flexible hood with the air moving means located within the flexible hood and the filter located outside the flexible hood, the air moving means and the filter being in communication through an aperture in the wall of the flexible hood, and a source of power connected to the air moving means for driving the air moving means to suck air from the ambient atmosphere through the filter to fill the space within the hood.

Respiratory protective apparatus in accordance with the present invention provides a continual supply of clean, filtered air to the wearer of the flexible hood without the need for employing an inhale valve or a source of breathable gas.

The supply of filtered air to the wearer of the flexible hood maintains a positive pressure within the hood preventing the ingress of noxious gases past the neck seal.

Respiratory protective apparatus according to the present invention need not include an exhale valve in the wall of the hood when the neck seal permits sufficient leakage of gas from the interior of the hood. However, when an efficient neck seal is employed, for example when the neck seal is constituted by a septum of a highly elastic polymer such as silicone or polyurethane, leakage past the neck seal is so low that an exhale valve must be included in a wall of the hood permitting gas pressures generated within the hood to be relieved to atmosphere.

When an exhale valve is employed in respiratory protective apparatus according to the present invention an inhale valve may optionally be included in the aperture to establish uni-directional flow.

In one embodiment of the invention which will be described the neck seal comprises an elasticated band through which there is threaded a draw string, the ends of which are provided with a toggle for securing the draw string to maintain the neck seal in any desired position.

Alternatively, as already indicated, the neck seal may be a septum of a polymer material having an elasticity high enough to provide an effective seal around necks of varying diameters.

Preferred embodiments of the present invention provide respiratory protective apparatus which may be used to protect a person of any age from an infant to an adult. When the respiratory protective apparatus incorporates a neck seal which is an elasticated band with a draw string and a toggle, and when the respiratory protective apparatus is used by an infant the hood is placed over the upper half of the infant's body and the draw string tightened round the waist of the infant and secured by the toggle to prevent noxious gases from the atmosphere entering the space enclosed within the hood. This space is fed with air drawn by the air moving means through the filter and cleaned of noxious substances which may be nuclear, biological or chemical.

Similarly, when the respiratory protective apparatus according to the present invention includes a neck seal which is a septum of highly elastic polymer material, the elasticity of the neck seal is such that it will readily engage and provide efficient seal around the waist of an infant or the neck of any adolescent child or any adult.

Respiratory protective apparatus according to the present invention is therefore adaptable for use by a person of any age and when used on an infant provides access to the lower part of the infant's body, for example for changing a nappy, without any risk of the upper torso and respiratory tract of the infant receiving noxious gases from the atmosphere.

In a preferred respiratory protective apparatus according to the present invention the filter and the air moving means each includes a threaded mounting means, one of said mounting means being internally threaded and the other of said mounting means being a co-operating externally threaded mounting means enabling the filter and the air moving means to be mounted in the aperture by screwing the respective threaded mounting means into engagement.

Advantageously the source of power is carried on the head of an adult wearer wearing the flexible hood of respiratory protective apparatus according to the present invention. The source of power may be carried directly on the hood, in an external pocket on the wall of the flexible hood or the source of power may be carried indirectly on the hood by being carried between the filter and the air moving means.

When the filter and the air moving means are mounted by cooperating threaded mounting means, the

source of power comprising a plurality of batteries may be mounted in a housing surrounding the engaged cooperated threaded means and mounted between the filter and the aperture in the hood.

The carrying of a power source in an external pocket on the wall of the hood or in a housing mounted on the engaged cooperating threaded mounting means is very convenient when a small power pack designed for providing positive pressure inside the hood for a period, for example, of two hours is used.

Alternatively if a larger and heavier power pack designed to provide positive pressure inside the hood for a duration, for example, of eight hours is employed, the power pack may be arranged to be supported independently of the hood, for example on the belt of an adult wearer.

Specifically in accordance with one aspect of the present invention there is provided respiratory protective apparatus which comprises a transparent flexible hood, a neck seal at a lower open edge of the transparent flexible hood, a ring housing defining an aperture in a wall of the flexible hood, an air moving means comprising a fan/motor unit mounted in the ring housing with the fan inside the transparent flexible hood, the air moving means having a threaded portion extending through the ring housing, a filter

having a threaded portion corresponding to the threaded portion of the air moving means, the filter being mounted externally of the transparent flexible hood by screwing the threaded portion of the filter to the threaded portion of the air moving means such that the filter and the air moving means are in direct communication through the aperture, a power pack supported on the hood, and means connecting the power pack to the air moving means whereby the air moving means sucks air from a noxious ambient atmosphere through the filter to fill the space within the transparent flexible hood while the neck seal engages the neck of an adult wearer of the hood or the waist of an infant wearer of the hood.

In accordance with a further feature of the present invention ear surrounds are provided for at least partially encircling the ears of the wearer of the transparent flexible hood. The ear surrounds are designed to baffle the noise of the motor of the air moving means and make it easier for the wearer to hear when spoken to.

The present invention will be further understood from the following detailed description of preferred embodiments thereof which is made, by way of example, with reference to the accompanying diagrammatic drawings in which:

Figure 1 shows respiratory protective apparatus in accordance with the invention being worn by an adult,

Figure 2 shows respiratory protective apparatus according to the present invention being used on a baby,

Figure 3 shows an alternative form of flexible hood and neck seal for use in respiratory protective apparatus in accordance with the present invention,

Figure 4 shows a flexible hood similar to that illustrated in Figure 3 in respiratory protective apparatus according to the present invention in use on the head of an adult wearer, and

Figure 5 shows the respiratory protective apparatus of Figure 4 in use on an infant.

In the drawings the same or similar parts are designated by like reference numerals.

The respiratory protective apparatus illustrated in Figure 1 comprises a flexible hood 1 which is a clear lightweight hood and may be made, for example, of PVC or a bilaminar polymer, the latter being preferable if the hood is to be used for protection against nuclear, biological and chemical gases. The transparent flexible hood 1 includes a stiffer visor portion 2 for positioning in front of the face of a wearer to provide good visibility.

front wall of the flexible hood 1.

The flexible hood 1 further includes an external pocket 9 on a back wall of the hood 1, a compact power pack 10 capable of driving the air moving means 8 for a period of two hours being located in the pocket 9.

The power pack 10 is connected to the air moving means 8 by a short wire 11, a long wire 12 and a plug and socket device 13 of which the socket is connected by the short wire 11 to the power pack 10.

In operation a wearer inserts the plug in the socket of the device 13, thereby energising the air moving means 8. The hood 1 is placed over the head of the wearer and the air moving means 8 draws ambient air through the filter 7 and inflates the flexible hood 1 to maintain a reservoir of filtered air about the head of the wearer.

The air moving means 8 and the filter 7 are in direct communication without the interposition of an inhale valve. When the wearer exhales some of the exhaled gas may escape through the aperture defined by the ring housing 14 and through the filter 7, notwithstanding the action of the air moving means 8. Exhaled gases also escape past the neck seal 3.

In Figure 2 of the accompanying drawings the

respiratory protective apparatus of Figure 1 is shown in use on a baby. The neck seal 3 of the hood is passed over the head, arms and shoulders of the baby, and the draw string 5 is tightened about the baby's waist and secured in the tightened position by the toggle 6.

In Figure 3 of the accompanying drawings there is shown an alternative embodiment of the flexible hood and neck seal for use in respiratory protective apparatus according to the present invention. The flexible hood 21 includes a stiff visor member 22 to which the flexible hood is secured in a manner to form a flat top 23 to the hood such that the visor portion stands naturally away from direct contact with the face of an adult wearer of the hood. The flexible hood 21 includes a neck seal 24 constituted by a septum of a highly elastic polymer material such as silicone, polyurethane or butyl with a small circular aperture 25 located therein. The diameter of the aperture 25 is less than the diameter of an infants' waist or the neck of a child but the elastic polymer material of the septum 24 is sufficiently elastic to be extended readily around the neck of any adult and adequately grips the neck of any person or the waist of any infant child around which the flexible hood may be placed as shown in Figures 4 and 5 respectively.

The flexible hood 21 illustrated in Figure 3 includes an aperture defined by a ring housing 26 and an exhale valve 27 for releasing excess pressure generated within the hood on exhalation.

Referring to Figure 4 a flexible hood 21 is shown with a fan/motor unit 28 and filter 29 mounted in the aperture defined by the ring housing 26 in a similar manner to that already described with reference to Figure 1. However, in the embodiment of Figure 4 the power source comprising a number, for example four, of electric batteries is located in a housing 30 of octagonal or similar shape supported on the cooperating threaded mounting means between the fan/motor unit 28 and the filter 29.

The fan motor is started up by connecting together a plug and socket similar to plug and socket device 13 of the apparatus of Figure 1, before the flexible hood 21 is donned by an adult wearer, or placed over the torso of an infant child, as illustrated in Figure 5.

Either of the flexible transparent hoods illustrated in the accompanying drawings may be provided with ear surrounds which at least partially encircle the ears of the wearer of the transparent flexible hood.

The ear surrounds may be provided by external means

such as a strap placeable over the head of the wearer with external ear surrounds urging the flexible hood against the ears of the wearer. Such ear surrounds having the effect of baffling the noise of the motor of the air moving means, so making it easier for the wearer of the hood to converse with another person.

Alternatively the ear surrounds may be incorporated in the hood itself and be fixed to the internal wall of the flexible hood with a suitable curved stiffener in the hood to maintain the ear surrounds in contact with the ears of the wearer or with the head of the wearer near the ears.

If the ear surrounds are urged into substantially sealing contact with the ears of the head of the wearer around the ears, the flexible hood may have an aperture at one or both ears thereby enabling speech or other sounds outside the hood to reach the wearer direct while wearing the respiratory protective apparatus.

CLAIMS:

1. Respiratory protective apparatus comprising a flexible hood capable of enveloping the head of an adult wearer, a neck seal at an open lower edge of the hood for engaging the neck of an adult wearer, an air moving means, a filter, and a source of power connected to the air moving means for driving the air moving means to suck air from the ambient atmosphere through the filter to fill the space within the hood, both the air moving means and the filter being mounted to the wall of the flexible hood with the air moving means located within the flexible hood and the filter located outside the flexible hood, the air moving means and the filter being in communication through an aperture in the wall of the flexible hood.

2. Respiratory protective apparatus according to Claim 1 wherein the neck seal is an elasticated band having a draw string passing therethrough, and a toggle for securing the draw string to define an opening smaller than the natural length of the elasticated band.

3. Respiratory protective apparatus according to Claim 1 wherein the neck seal is a septum of a polymer material having an elasticity high enough to provide an effective seal around necks of varying diameters and wherein the hood includes an exhale valve.

4. Respiratory protective apparatus according to any one of the preceding Claims, wherein the filter and the air moving means each includes a threaded mounting means, one of said mounting means being internally threaded and the other of said mounting means having a corresponding external thread thus enabling the filter and the air moving means to be mounted in the aperture by screwing the respective threaded mounting means into engagement.

5. Respiratory protective apparatus according to any one of the preceding Claims wherein the source of power is carried on the head of an adult wearer wearing the flexible hood.

6. Respiratory protective apparatus according to Claim 5 wherein the source of power is carried in an external pocket on the wall of the flexible hood.

7. Respiratory protective apparatus according to Claim 5 wherein the source of power is carried between the filter and the air moving means.

8. Respiratory protective apparatus according to Claim 4 wherein the source of power comprises a plurality of batteries mounted in a housing surrounding the engaged threaded mounting means and located between the filter and the aperture in the hood.

9. Respiratory protective apparatus according to any one of the preceding Claims which further includes a plug and socket connecting means, one of which is connected to the source of power and the other of which is connected to the air moving means, the plug being engagable in the socket to energise the air moving means.

10. Respiratory protective apparatus which comprises:

- i) a transparent flexible hood,
- ii) a neck seal at a lower open edge of the transparent flexible hood,
- iii) a ring housing defining an aperture in a wall of the flexible hood,
- iv) an air moving means comprising a fan/motor unit mounted in the ring housing with the fan inside the transparent flexible hood, the air moving means having a threaded portion extending through the ring housing.
- v) a filter having a threaded portion corresponding to the threaded portion of the air moving means, the filter being mounted externally of the transparent flexible hood by screwing the threaded portion of the filter to the threaded portion of the air moving means such that the filter and the air moving means are in direct communication through the aperture,
- vi) a power pack supported on the hood, and

vii) means connecting the power pack to the
air moving means

whereby the air moving means sucks air from a noxious ambient atmosphere through the filter to fill the space within the transparent flexible hood while the neck seal engages the neck of an adult wearer of the hood or the waist of an infant wearer of the hood.

11. Respiratory protective apparatus according to any one of the preceding Claims wherein there are further provided ear surrounds for at least partially encircling the ears of the wearer of the flexible hood.

12. Respiratory protective apparatus substantially as hereinbefore described with reference to the accompanying drawings.

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FIG. 1.

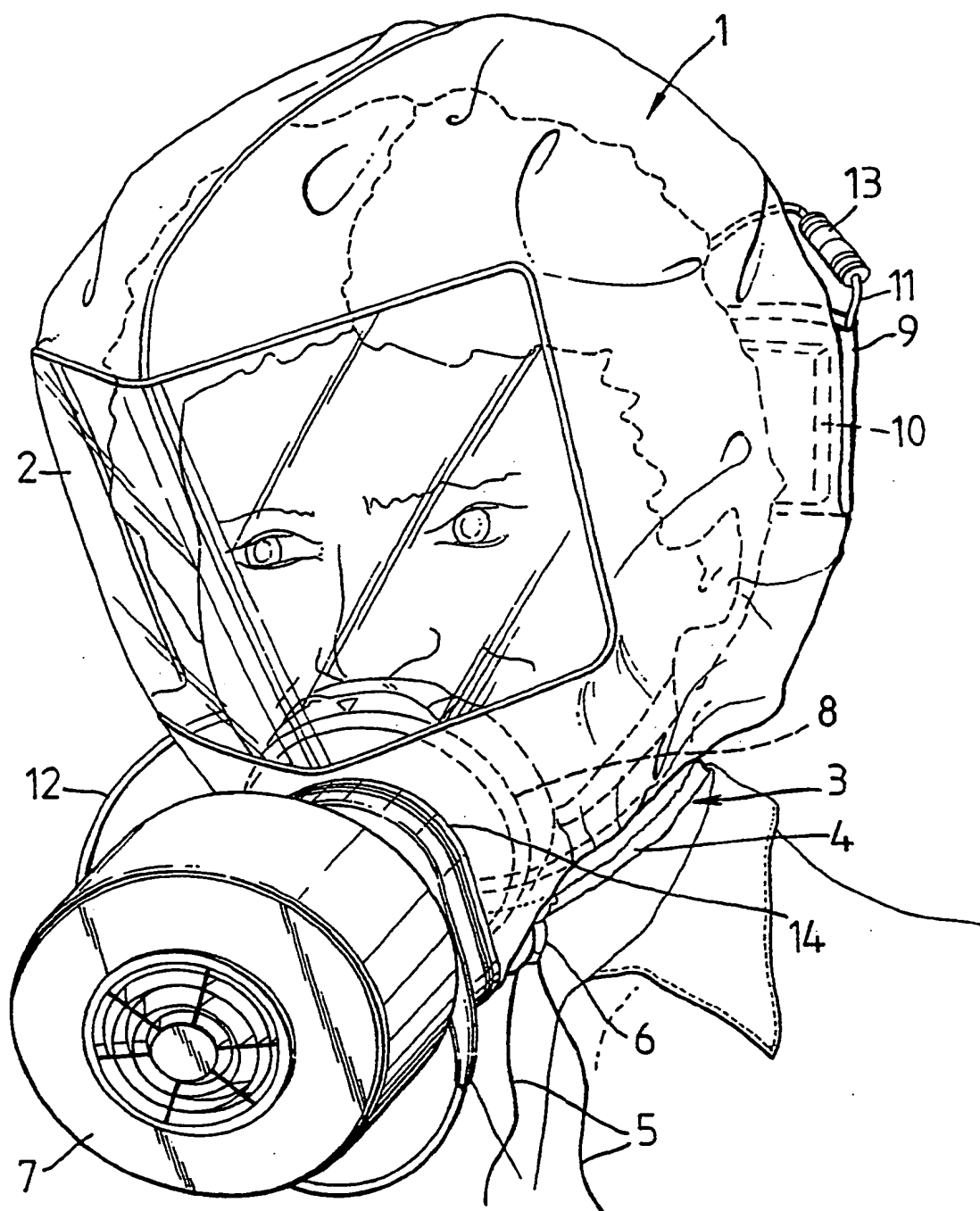


FIG. 2.

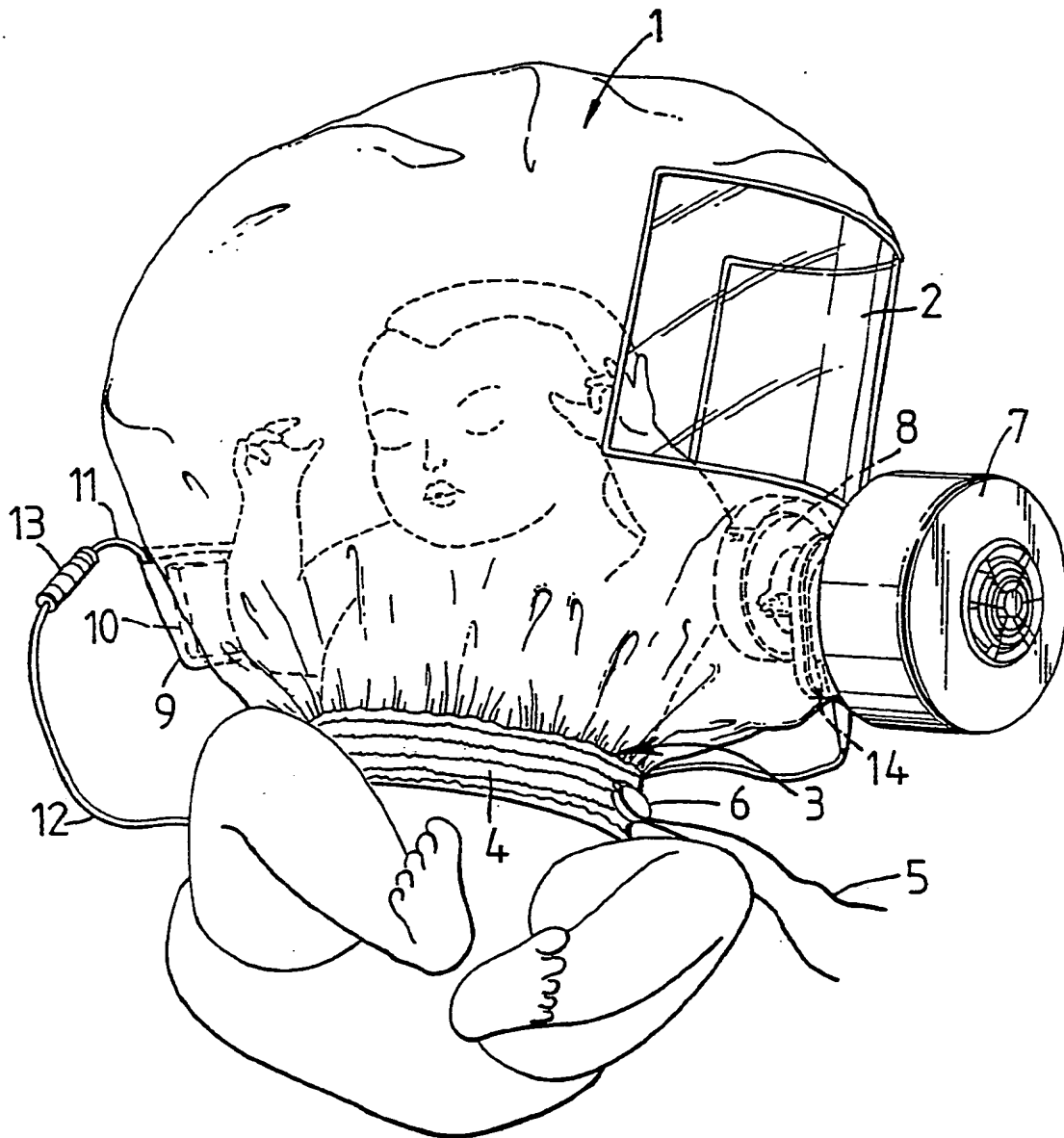


FIG. 3.

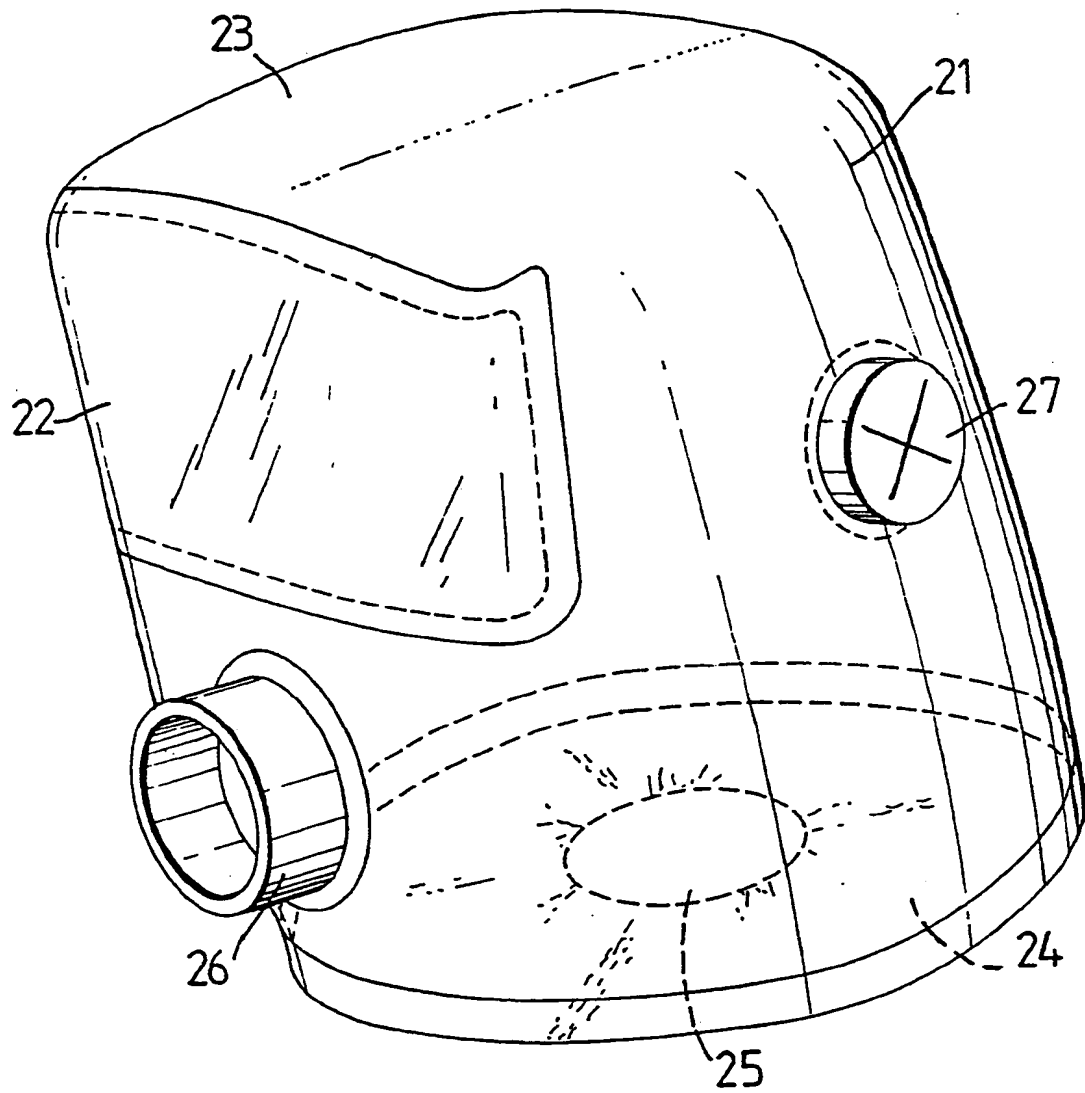
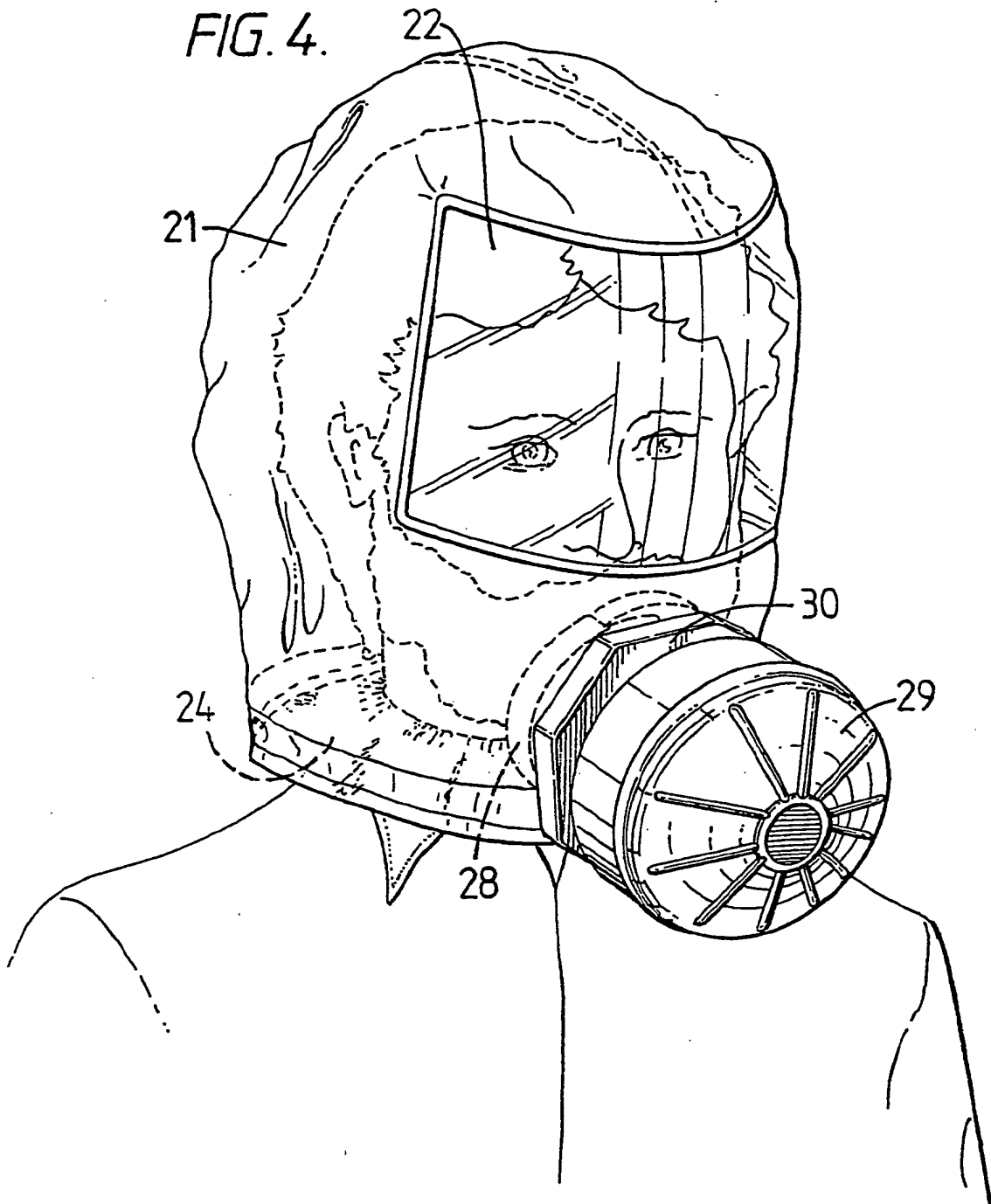


FIG. 4.



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FIG. 5.

